Public Comment Period - February 15, 2000 to March 15, 2000

Proposed Plan for
Operable Unit V
Peconic River/Sewage Treatment Plant
Brookhaven National Laboratory

(*Note:* Technical and administrative terms are used throughout this Proposed Plan. When these terms are first used, they are printed in ***bold italics***. Explanations of these terms, document references, and other helpful notes are provided in the margins.)

Figure 1. *Brookhaven National Laboratory's Sewage Treatment Plant and the headwaters of the Peconic River.*

Inside This Plan

Meetings

For meeting times and locations, see page 4.

I. Introduction

This plan describes a remedy for an area known as Operable Unit V at Brookhaven National Laboratory (BNL). This area includes BNL's Sewage Treatment Plant and the headwaters of the western branch of the Peconic River (Figure 1).

The U.S. Department of Energy (DOE) has identified this proposed alternative as its cleanup recommendation. The actual remedy will be selected only after the public comment period has ended and the information submitted during this time has been reviewed and considered.

The proposed remedy may be modified or a different remedial action may be selected based upon public comments. The public is encouraged to review and comment on all alternatives identified here.

Proposed Plan - document requesting public input on a proposed remedial alternative (cleanup plan).

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) - a federal law that establishes a program to identify, evaluate, and remediate sites where hazardous substances may have been released, leaked, poured, spilled, or dumped into the environment; also known as Superfund.

Remedial Investigation/ Feasibility Study (RI/FS) - studies required by CERCLA to characterize the nature and extent of contamination due to past releases of hazardous and radioactive substances to the environment, to assess risks to human health and the environment from potential exposure to contaminants, and to evaluate cleanup actions.

Administrative Record - documents including correspondence, public comments, and technical reports upon which the agencies base their remedial action selection.

millirem (mrem) - a unit of radiation exposure to people. The average yearly radiation exposure from natural sources for a United States resident is 300 mrem. (A millirem is 1/1000 of a rem.)

This ***Proposed Plan*** provides a description of site concerns and discussion of completed investigations, a summary of risk assessments performed, evaluations of remedial alternatives, and recommendations for the preferred alternative.

This document is required by the Superfund Law ***(Comprehensive Environmental Response, Compensation and Liability Act of 1980)***. It summarizes information from three documents:

1. The *Operable Unit V* ***Remedial Investigation Report*** describes the nature and extent of contamination at the site. The Baseline Risk Assessment portion of this document reports on the risk to both human health and the environment in the absence of cleanup.

2. The *Plutonium Contamination Characterization and Radiological Dose and Risk Assessment Report* describes the results of additional sampling of on- and off-site Peconic River sediments, as well as surface water, groundwater, and soils at the Lab's sewage treatment plant and a retired and capped former sewer line. These materials were analyzed for plutonium and other radionuclides.

3. The *Operable Unit V* ***Feasibility Study Report*** describes how the cleanup options were developed and evaluated.

These reports and other documents pertaining to Operable Unit V are included in the site's ***Administrative Record***, which contains information that will be used to determine the final remedy. This Record is available for public review at the locations listed on page 14 and at the end of this document.

II. Proposed Remedy

Elevated levels of metals and PCBs, and low levels of radionuclides, were detected in Peconic River sediments.

Several alternatives were evaluated for cleanup of the sediment in the Peconic River. Based on these evaluations, proposed cleanup actions (called the remedy) are recommended by DOE and are summarized below. The public is invited to comment on the proposed remedy as well as on the other alternatives considered.

Based on an evaluation of the alternatives, DOE believes that the alternative for sediment cleanup that represents the best balance of EPA's remedy selection criteria is **Excavation of contaminated Peconic River sediments/dewatering in drying beds/off-site disposal**. The proposed remedy also includes a localized removal of soil contaminants at the Lab's sewage treatment plant and additional monitoring and characterization of contaminants in groundwater.

The proposed remedy involves excavating Peconic River sediment containing copper, mercury, and silver at concentrations above cleanup goals (see Basis for Cleanup, page 16). PCBs and DDD are largely co-located with the elevated metals, and will be cleaned up during remediation of the metals. Radionuclides, mainly cesium-137 and low levels of plutonium, are below acceptable levels established by the United States Environmental Protection Agency (15 ***millirem***/year above background), but will also be removed during sediment cleanup where they are co-located with the elevated metals. The sediment will then be dewatered and shipped to a licensed off-site disposal facility.

The general areas that may require sediment excavation are indicated in Figure 2. The locations and amounts of sediment to be removed from within these areas will be determined during the design-engineering phase of the OU V remedy. During the design phase, there will be further delineation of the range of contaminant concentrations that are greater than the cleanup goals. This additional information will be used to develop a remediation plan that will more accurately identify those areas where contaminant levels are above the cleanup goals. The exact locations and amounts of sediment to be removed from these areas will be determined by field screening and confirmatory sampling during excavation.

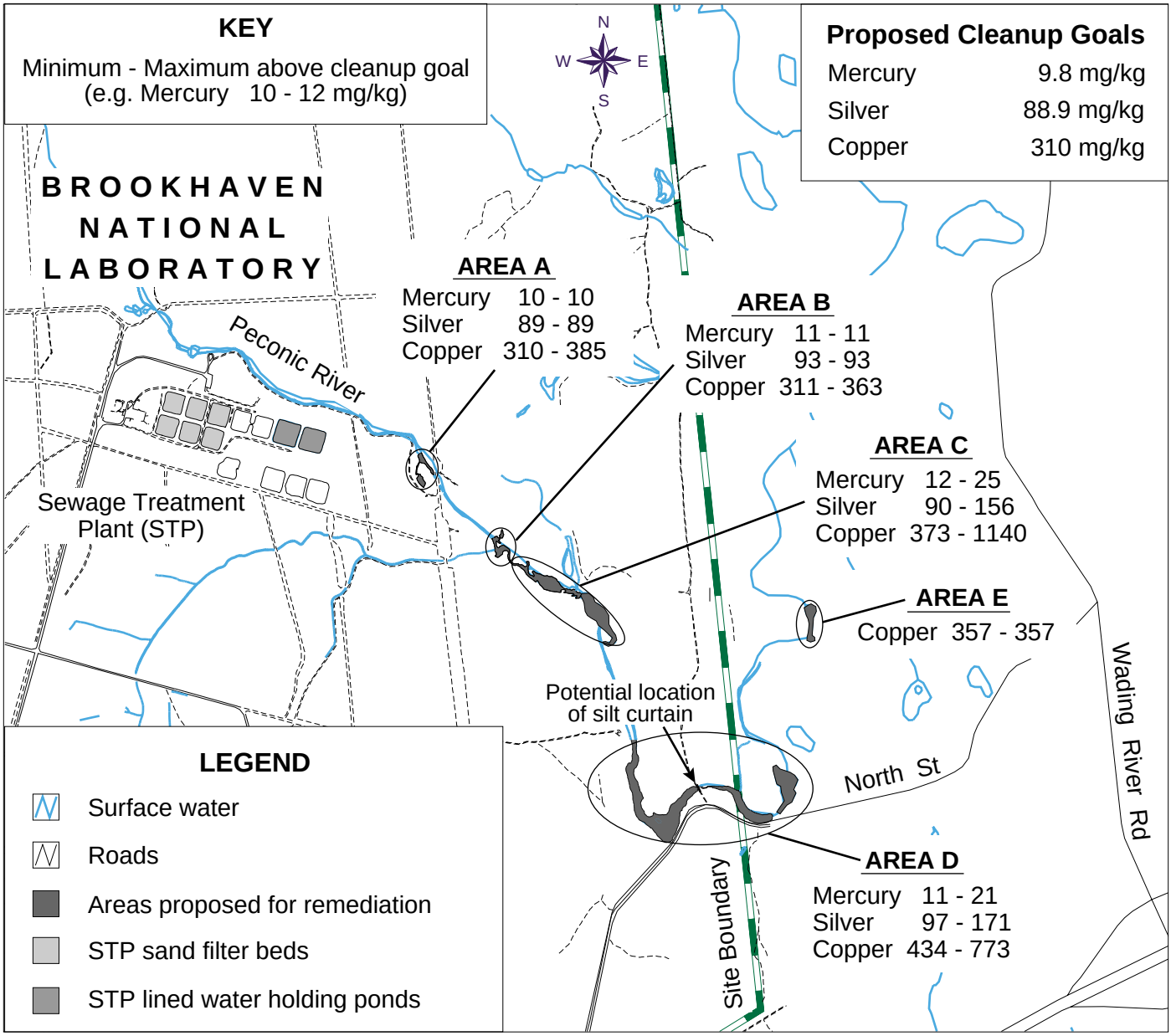

Figure 2. *Areal extent of sediments contaminated or potentially contaminated with metals above toxicity-based cleanup goals.*

Meetings

Public Meeting
(no reservation needed)

Berkner Hall, BNL
March 2, 2000
7:00 - 9:00 p.m.

Roundtable Meetings
(reservation requested)

Berkner Hall, BNL
February 23, 2000
7:00 - 9:00 p.m.

Riverhead High School
Riverhead, NY
February 29, 2000
7:00 - 9:00 p.m.

To attend a roundtable meeting, please call Kathy Gurski at (631) 344-7459 and make a reservation.

trichloroethene (TCE) - solvent formerly used at BNL to clean metal parts and machinery.

parts per billion (ppb) - a ratio of the mass of a contaminant to the total mass of the contaminant and medium (usually soil or water). For example, 1 ppb of TCE can mean 1 gram of TCE in 1 billion grams of water.

picocuries - a unit of measure for radioactivity. One curie corresponds to 37 billion disintegrations per second; one picocurie is one-trillionth of a curie, or in other words, 0.37 disintegrations per second.

picocuries per liter (pCi/l) - a unit of measure of radioactivity per liter of groundwater.

Area of Concern (AOC) - a geographic area of BNL where there has been a release or the potential for a release of a hazardous substance, pollutant or contaminant including radionuclides

Soils in the sand filter beds and adjacent berms at the Sewage Treatment Plant (STP) contain elevated levels of mercury, silver, chromium, lead and radionuclides. A best management practice localized removal of soil contamination is proposed to remove high levels of mercury and cesium-137. This removal of contamination will reduce the potential for leaching and subsequent migration to groundwater and the Peconic River and will reduce potential risks associated with cesium-137 in soils. Soils from the sand filter beds and berms exceeding cleanup goals would be removed through excavation. Excavated portions of the sand beds would be replaced with sand or gravel, and excavated areas on the berms would be backfilled with clean fill, compacted and graded. Excavated materials will be disposed of in a licensed off-site disposal facility.

Low levels of volatile organic compounds (VOCs), primarily ***trichloroethene*** (or trichloroethylene, TCE) were detected in groundwater both on and off site. The highest concentration of TCE found on site was 32 ***parts per billion (ppb)***, and off-site levels had a maximum of 8.5 ppb (the drinking water standard is 5 ppb). These values are reported in the Remedial Investigation Report. A more recent sampling in 1999 found a maximum TCE concentration on site of 17 ppb and a maximum off-site concentration of 8.2 ppb. Tritium was found with maximum levels about 1/10 of the drinking water standard of 20,000 ***picoCuries per liter (pCi/l)***.

To be sure that the health of the residents located downgradient of OU V is protected, homes and businesses in the OU V area were offered public water in 1997. Outpost monitoring wells have been placed along the predicted path of the groundwater and additional monitoring data will be collected. If future monitoring data suggest a need for a groundwater remedy, the OU V remedy will be modified.

The proposed remedies for the ***Areas of Concern (AOCs)*** in OU V are summarized in Table 1. This remedy includes a completed removal action at the Sewage Treatment Plant Imhoff Tanks, and decisions to take no further action where no contamination was found.

III. Community Role in Selection Process

DOE encourages public input to ensure that the preferred remedy for Operable Unit V effectively meets community needs and protects human health and the environment.

Written comments on the Feasibility Study Report and the Proposed Plan will be accepted for a period of 30 days from February 15 through March 15, 2000. For your convenience, a pre-addressed comment sheet can be found on the final page of this document.

Interested community members can attend either of two roundtable meetings to speak with project personnel and learn more about the Proposed Remedy. (Meeting times and locations are given in the box at left.) DOE and BNL will also hold a public meeting on March 2, 2000 to present the conclusions of the Feasibility Study and the Proposed Remedy and receive public comments on the two documents.

After considering public comments, DOE, EPA, and DEC will make a final decision on the cleanup remedy for Operable Unit V. The decision will be formalized in a document called the ***Record of Decision (ROD)***.

Table 1.	Summary of Proposed Remedies and Completed Removal Actions in Operable Unit V	
Area of Concern	**Name**	**Selected Remedial Actions**
4	Peconic River Sediments	Excavation, dewatering and off-site disposal for sediments above cleanup goals.
4A	Sludge Drying Beds	No action. No significant contamination is present.
4B	Sand Filter Beds and Berms	Localized removal of soil to remove high levels of mercury and cesium-137.
4C	Imhoff Tank	Completed Removal Action. Contents removed, disposed off site, structures demolished, filled and capped.
4D	Hold-up Ponds	No action. Hold-up ponds have not leaked. Groundwater monitoring network will be put in place as part of the Groundwater Improvement Program (Phase II) to assure continued effectiveness of the Hold-up Ponds.
4E	Satellite Disposal Area	No action. No significant contamination is present. Bromine trifluoride cylinders and boxes containing laboratory chemicals were removed.
21	Formerly Leaking, Retired and Capped Sewer Pipes	No action for soils. No significant contamination. Pipes were replaced in 1993.
23	Eastern Component of Off-site Tritium Plume (VOC Contaminated Groundwater)	Continued groundwater monitoring. Tritium levels are well below the Maximum Contaminant Level (MCL). Off-site levels of VOCs are slightly greater than the MCL of 5 ppb. Homes were offered public water in 1997.

Attached to the ROD will be a Responsiveness Summary, which will summarize public comments and DOE responses to those comments. Following final remedy selection, these documents will be available for public review. Finally, the public will be kept informed during the remedy implementation phase.

IV. Site Background

BNL is a Department of Energy laboratory conducting research in physical, biomedical, and environmental sciences, as well as in selected energy technologies. Brookhaven Science Associates, a not-for-profit research management organization, operates BNL under a contract with DOE.

BNL is located 60 miles east of New York City, close to the geographic center of Suffolk County on Long Island, New York (Figure 3). It is bordered on the west by the William Floyd Parkway, on the east by residential areas and parkland, on the north by residential areas, and on the south by the Long Island Expressway.

Record of Decision (ROD) - documents the regulators' decision on a selected remedial action, and includes the responsiveness summary and a bibliography of documents that were used to reach the remedial decision. When the ROD is finalized, remedial design and construction begin.

For More Information

For more information on this project in particular or Brookhaven National Laboratory's environmental restoration program in general, contact:

Ken White
Community Relations
Brookhaven National Lab
Building 134
P.O. Box 5000
Upton, NY 11973-5000
(631) 344-4423

National Priorities List - a formal listing of the CERCLA sites that have been identified for possible remediation. Sites are ranked by the EPA based on their potential for affecting human health and the environment.

Operable Unit (OU) - an administrative designation grouping geographical portions of a site, specific site problems, or initial phases of an action. Operable Units may also consist of any set of actions performed over time or any actions that are concurrent but located in different parts of a site. BNL has six Operable Units.

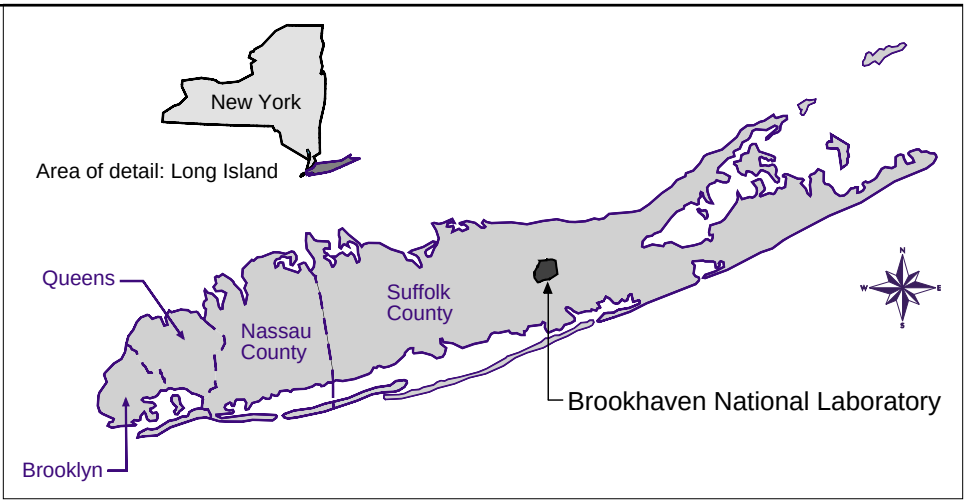

Figure 3. *Brookhaven National Laboratory's location with respect to New York State and Long Island.*

In 1980, the BNL site was placed on the New York State Department of Environmental Conservation (DEC) list of Inactive Hazardous Waste Disposal Sites. In 1989, it was included on EPA's ***National Priorities List*** of Superfund sites. BNL's inclusion on the Superfund and DEC lists was primarily due to the effects of discontinued past operations, which could impact Long Island's sole source aquifer, the Island's sole primary drinking water source.

BNL has a total of 29 Areas of Concern. To ensure effective management of them, these areas were grouped into six distinct ***Operable Units***. These Operable Units are shown in Figure 4 and are described in Table A-1 in Appendix A of this document.

Operable Unit V consists of three Areas of Concern: the Sewage Treatment Plant (AOC 4, Figure 5); Capped and Retired Formerly Leak-

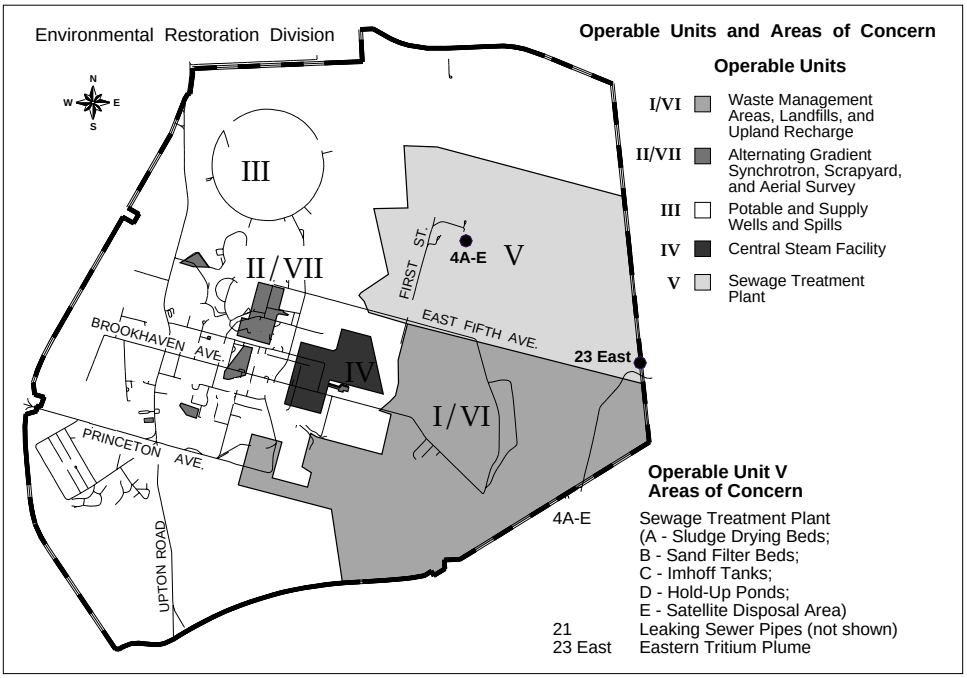

Figure 4. *Brookhaven National Laboratory's six Operable Units, and OU V Areas of Concern.*

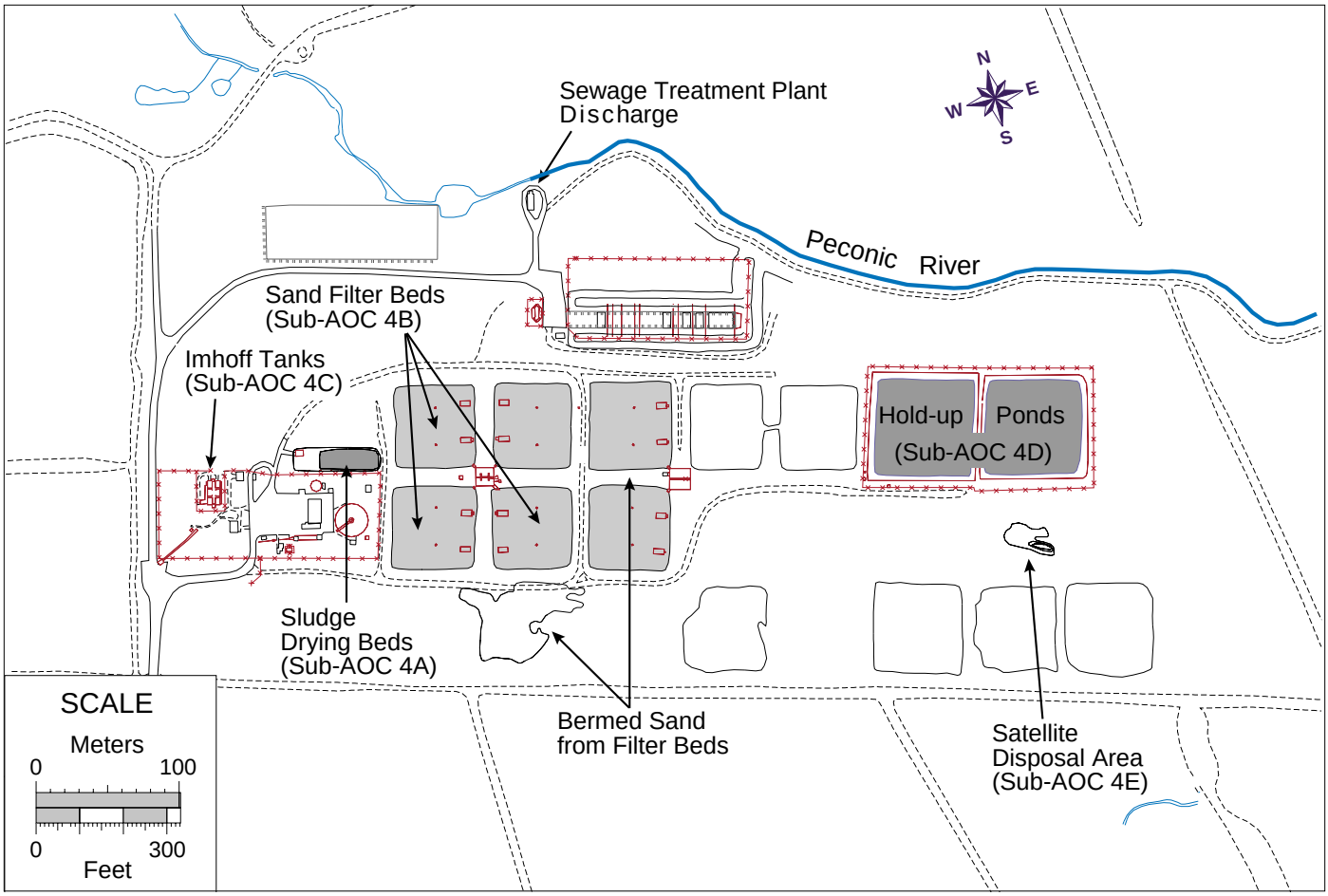

Figure 5. *BNL's Sewage Treatment Plant (AOC 4) and the Sub-Areas of Concern within the plant.*

ing Sewer Pipes within the Operable Unit (AOC 21, Figure 6); and the Former Eastern Tritium Plume (AOC 23). The Sewage Treatment Plant AOC includes Peconic River sediment and surface water, the soils in the area of the Sand Filter Beds, Hold-up Ponds, and the Satellite Disposal Area. The OU V AOCs are described in detail in Table A-2 in Appendix A of this document.

V. Remedial Investigation Summary

An OU V Remedial Investigation was conducted to identify the nature and extent of soil, sediment, groundwater and surface water contamination. The investigation included geophysical and biological surveys; sampling of soil, groundwater, surface water, and sediments; chemical and radiological analyses; benthic invertebrate toxicity testing; fish bioaccumulation studies; data validation; and preparation of the Remedial Investigation and Risk Assessment Report. Subsequent to the final Remedial Investigation report, BNL conducted a more comprehensive sampling of soils, sediment, and water for plutonium, uranium and other radionuclides. The results of this study are reported in the *Plutonium Contamination Characterization and Radiological Dose and Risk Assessment Report.*

State and Federal standards, criteria and guidances were reviewed to evaluate the nature and extent of contamination in soil, sediment, groundwater and surface water. Screening criteria used to identify contamination were derived from these requirements. These screening criteria are given

How You Can Participate

Whether you are new to BNL and are reviewing this type of document for the first time, or you are familiar with the Superfund process, you are invited to:

• **Read** this proposed plan and review additional documents in the Administrative Record file at Information Repository locations listed on pages 14 and 24; and access fact sheets and other information about the Lab and the cleanup process on the internet at http://www.oer.dir.bnl.gov.

• **Call** BNL Community Relations (631-344-7459) to ask questions, request information, or make arrangements for a briefing.

• **Attend** a public meeting or information session (listed on page 4).

• **Comment** on this plan at the meeting or submit written comments (see comment form on back cover).

• **Contact** the DOE project manager (see page 20).

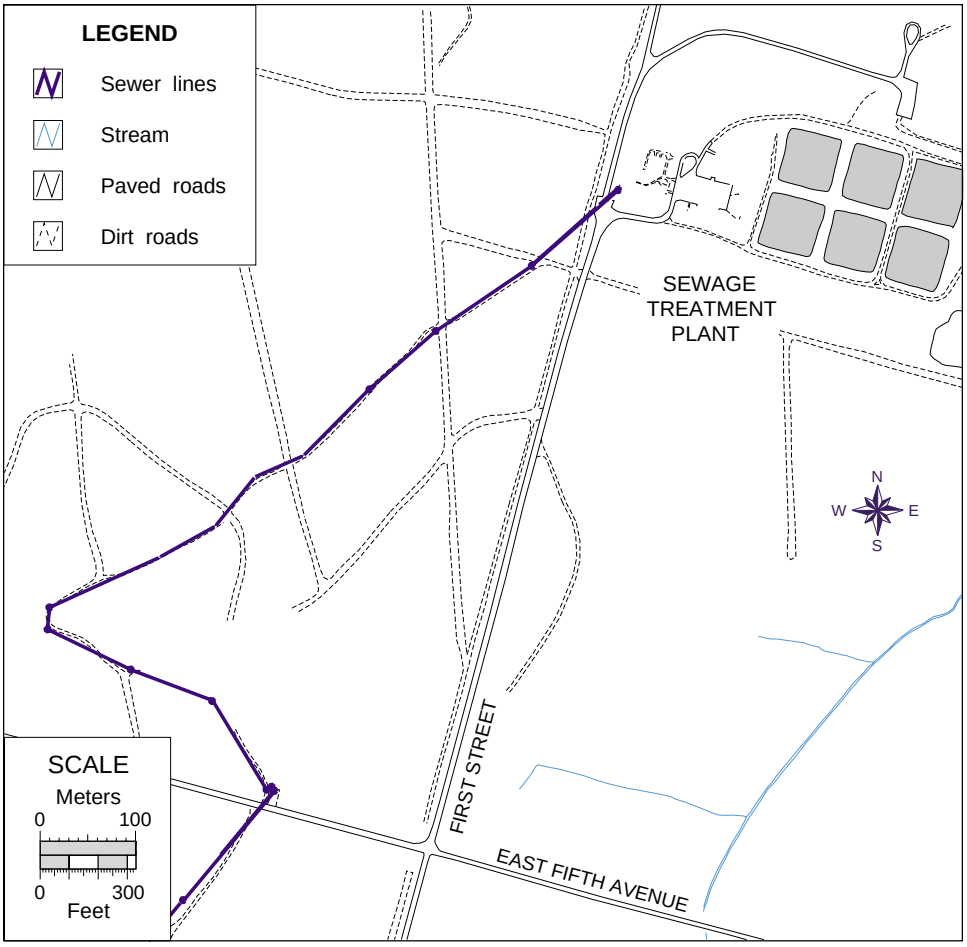

Figure 6. *BNL's retired and capped sewer lines (AOC 21).*

in the *Operable Unit V Remedial Investigation and Risk Assessment Report*.

The principle contaminants that have been released to the Sewage Treatment Plant include metals, solvents, and radionuclides.

Elevated levels of metals and PCBs, and low levels of pesticides and radionuclides, were detected in Peconic River sediment. Concentrations were highest in on-site surface sediments and most prominent in the on-site depositional areas located approximately 0.5 mile, 1 mile, and 1.5 miles downstream of the STP (Areas A, B, C and D of Figure 2).

The following is a summary of the range of contaminants found in the Peconic River sediments, Sewage Treatment Plant soils, fish, sludge inside and soils surrounding the retired and capped sewer lines, and groundwater:

Peconic River sediments

Fourteen inorganic contaminants were detected at concentrations greater than the sediment-screening levels. Of these, the metals mercury (maximum 24.5 mg/kg), silver (maximum 171 mg/kg), and copper (maximum 1140 mg/kg) were detected most often, and at the highest concentrations above the screening level. Other analytes detected at concentrations above the screening level included the PCB Aroclor-1254 (maximum 1.5 mg/kg), DDD (maximum 0.096 mg/kg), DDE (maximum 0.089 mg/kg), alpha-chlordane (maximum 0.073 mg/kg), gamma-chlordane (maximum

0.043 mg/kg), and endosulfan (0.018 mg/kg). Contamination was highest in surface sediments and was most prominent in a depositional area approximately 1 mile downstream of the STP (Area C in Figure 2).

Cesium-137, americium-241, and plutonium 239/240 were found at higher activities in the Peconic River sediments than in the reference sediment samples collected from the Connetquot River, a river with similar characteristics as the Peconic River and outside the influence of the BNL site. The maximum cesium-137 concentration in sediments on site was 21.1 ***picoCuries per gram (pCi/g)***. The maximum americium-241 and plutonium-239/240 concentrations were also found on-site at 1.91 pCi/g and 0.158 pCi/g, respectively. Similar to the inorganic contaminants, the low level radionuclides detected were highest in the surface sediments and were most prominent in a depositional area approximately 1 mile downstream of the STP (Area C).

picocuries per gram (pCi/g) - a unit of measure of radioactivity per gram of a medium (usually soil).

Sewage treatment plant soils

Surface soils and subsurface soils in, or in the vicinity of, the Sewage Treatment Plant (including the sand filter beds and related berms) were found to contain elevated levels of several inorganic constituents including mercury, silver, copper, chromium, lead, zinc, and thallium. The maximum concentrations were 15.1 milligrams per kilogram (mg/kg) for mercury, 112 mg/kg for silver, 80.7 mg/kg for copper, 157 mg/kg for chromium, 95.5 mg/kg for lead, 60.7 mg/kg for zinc, and 1.2 mg/kg for thallium. Elevated levels were concentrated in the top 6 inches and did not extend beyond a depth of 3 feet.

In the soils of the sand filter beds and berms, the most frequently detected radionuclides were naturally occurring uranium-233/234 and uranium-238; all detected activities of both were within the range of background. Plutonium was detected less frequently, and at low activities. The maximum activity of plutonium-239/240 in the berms was 7.31 pCi/g, and in the sand filter beds was 0.399 pCi/g. The radionuclide with the highest levels was cesium-137; its levels were highest in the berms and areas adjacent to the sand filter-beds, with a maximum concentration of 98.8 pCi/g. Americium-241 was highest in the sand filter beds with a maximum concentration of 3.74 pCi/g. Generally, the activities of the radionuclides were highest in the top one foot of soil.

Peconic River fish

Fish collected from the Peconic River headwaters had bioaccumulated PCBs (the average Aroclor-1254 concentration in fish on site was 1.8 mg/kg). Naturally occurring uranium radionuclides were detected in some of the fish samples, with highest activities in the inedible portions of the fish. The radionuclide cesium-137 was detected most frequently. It was found in higher concentrations in fish collected on-site, and generally in slightly higher concentrations in the flesh and skin than in the bone and viscera. The highest activity of cesium-137 in fish was in a whole-body sample of pickerel taken on site (2.712 pCi/g).

Sludge and soil (retired and capped sewer line)

The Laboratory sampled soils surrounding the areas where leaks were identified along the retired and capped sewer line during the Operable Unit V investigation. The results of the investigation identified only a few areas with low concentrations of inorganic constituents. This indicates

that the sewer line leading to the STP is not a likely source of significant contamination to the surrounding soils. The formerly leaking pipes in Operable Unit V were replaced in 1993. As part of a more recent investigation, sludge was collected from the bottom of manholes along the retired and capped sewer line and analyzed for radionuclides. The results identified elevated activities of a few radionuclides. Americium-241 and cesium-137 were found at the highest activities relative to screening levels, and plutonium was detected, generally at low levels.

Groundwater

Current groundwater sampling results indicate that levels of tritium in the groundwater are well below the drinking water standard. The highest concentration of trichloroethene (TCE) found on site during the Remedial Investigation was 32 ppb. Maximum off-site levels were 8.5 ppb, slightly greater than the drinking water standard of 5 ppb. Concentrations of VOCs are decreasing in magnitude. A more recent sampling in 1999 found a maximum TCE concentration on site of 17 ppb and a maximum off-site concentration of 8.2 ppb (Figure 7).

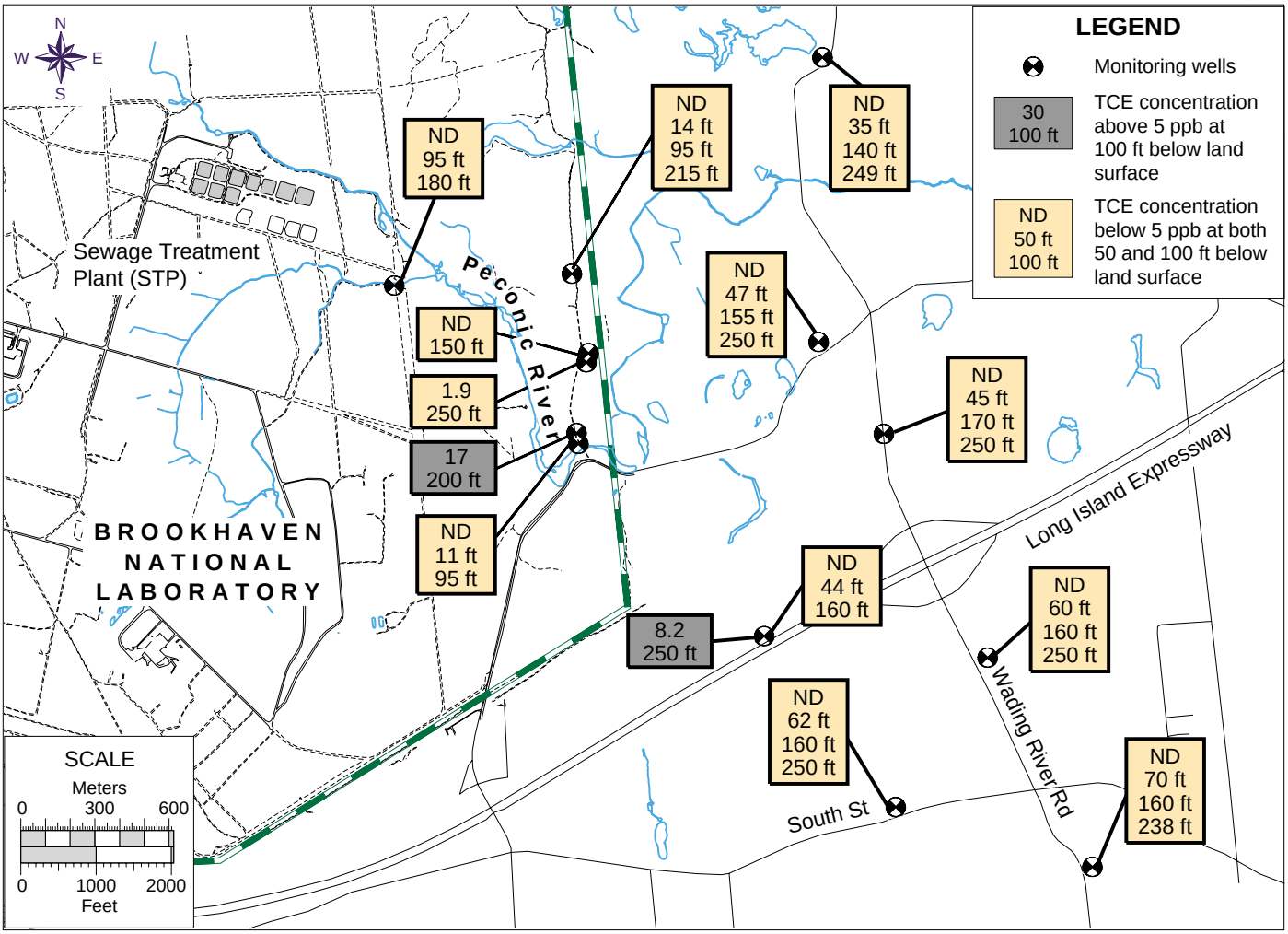

Figure 7. *September 1999 TCE levels downgradient from Operable Unit V and depths for which measurements are given.*

The elevated levels of TCE in groundwater off site were found at depths (200 feet) below the depths at which residential wells are typically screened, and public exposure to TCE in groundwater is unlikely. Homes and businesses in the OU V area were offered public water in 1997. Seventeen new monitoring wells have been installed as outpost wells on the eastern perimeter of the public water hookup area. Monitoring of contaminants in groundwater will continue.

Both soil and groundwater samples were collected in the area of the Hold-up Ponds during the investigations, and no evidence of leakage was found. No further action is planned and these ponds will remain as part of the operating Sewage Treatment Plant. A groundwater monitoring network will be put in place as part of the Lab's Groundwater Improvement Program (Phase II) to assure continued effectiveness of the Hold-up Ponds.

Extensive sampling and exploratory excavations were conducted at the Satellite Disposal Area and no evidence of contamination was found. In 1985, bromine trifluoride cylinders and two boxes of laboratory chemicals were removed from the Satellite Disposal Area. No additional remediation is planned for this area.

VI. Summary of Site Risks

A ***Baseline Risk Assessment*** evaluates potential ***risks*** from exposure to contaminants in the absence of remediation. The Baseline Risk Assessments conducted for Operable Unit V were reported in the *Final Operable Unit V Remedial Investigation Report* (May 27,1998) and the *Final Operable Unit V Plutonium Contamination Characterization and Radiological Dose and Risk Assessment Report* (January 31, 2000), in which the risk assessment also includes all radiologic data included in the Remedial Investigation Report. The results from the combined studies are reported here.

baseline risk assessment - an assessment required by CERCLA to evaluate potential risks to human health and the environment. This assessment estimates risks/hazards associated with existing and/or potential human and environmental exposures to contaminants at an area, assuming no remedial action is taken.

risk - an estimate of the probability that exposure to contamination at a release site will cause cancer development or noncarcinogenic health effects.

Human Health Risk Assessment

The Process

A four-step process is utilized for assessing site-related human health risks for a reasonable maximum exposure scenario: *Hazard Identification* — identifies the ***contaminants of concern*** at the site based on several factors such as toxicity, frequency of occurrence, and concentration. *Exposure Assessment* — estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (for example, ingesting contaminated well water) by which humans are potentially exposed. *Toxicity Assessment* — determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response). *Risk Characterization* — summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks.

contaminants of concern - contaminants detected at waste sites that present significant contributions to overall site risk. At BNL, these include:
- **radionuclides** including tritium, cesium-137 and strontium-90
- **volatile organic compounds** including trichloroethene, carbon tetrachloride and perchloroethene (degreasing solvents)
- **heavy metals** like silver, mercury and lead

The baseline risk assessment began with selecting contaminants of concern that could make a significant contribution to overall site risks. These contaminants include heavy metals like silver and mercury, trichloroethene, PCBs, and radionuclides.

The baseline risk assessment evaluated the health effects that could result from exposure to contamination as a result of dermal contact, inhalation and ingestion associated with current and potential future land use.

Hazard Index - an index used as a measure of the potential for site contaminants to present unacceptable noncarcinogenic toxic effects. When the hazard index is greater than 1, there may be concern for potential noncarcinogenic effects.

Two human health risks were addressed in the risk assessment for Operable Unit V: risk of cancer, and non-carcinogenic toxicity. Current federal guidelines for acceptable risks are an individual lifetime excess carcinogenic risk in the range of one-in-ten-thousand (1×10^{-4}) to one-in-one-million (1×10^{-6}) and a maximum ***Hazard Index*** equal to 1. A Hazard Index greater than 1 indicates a potential for noncarcinogenic health effects.

Exposure Assumptions

For Current Land Use, two on-site exposure scenarios were investigated: an on-site worker who could be exposed to surface soil through inhalation, ingestion, and direct contact; and an older child trespasser who might come into contact with contaminated soil, sediment and surface water in the Peconic River headwaters. Risks to current off-site residents were evaluated for exposure to contaminants through the ingestion of groundwater, fish and deer meat. The radiological risk assessment presented in the Plutonium Characterization and Risk Assessment Report also evaluated risks to an off-site resident living near the Sewage Treatment Plant exposed to contaminants in soil, sediment, surface water, groundwater, and fish.

For Future Land Use, two scenarios were investigated: an on-site construction worker, and future hypothetical residents living in the area of the current Sewage Treatment Plant. The construction worker was assumed to be exposed to contaminants through inhalation of soil particulates and dusts; incidental ingestion of soil; and direct dermal contact with soil. The hypothetical future resident was assumed to be exposed to contaminants in soil, sediment, surface water and groundwater after a loss of institutional control 30 or 50 years in the future. Exposure to contaminants in home-grown food and deer meat was considered as a pathway in the radiological risk analysis. A fish tissue bioaccumulation study was also conducted to determine potential risks to future residents who may consume contaminated fish caught on site.

receptor - someone or something that may receive an exposure to contaminants

Reasonable Maximum Exposure conditions were investigated for each potential ***receptor***.

Results

For Current Land Use, all risks for chemical contaminant exposures to the on-site worker and the trespasser, assuming no cleanup, were within EPA's acceptable risk range for carcinogenic risks and below the acceptable Hazard Index of 1 for non-carcinogenic hazards. Radiological risks to the trespasser were within EPA's acceptable risk range. Risks to the current on-site industrial worker using upper bound exposure estimates exceeded EPA's acceptable risk range, but were within control levels established for workers trained in radiation protection. This exposure was due primarily to external exposure associated with contamination in soils at the sewage treatment plant berms. Concentrations of contaminants found in fish and deer collected off site posed risks within EPA's accept-

able risk range. Concentrations of contaminants in groundwater off site were below the drinking water standard for tritium and slightly above the standard for TCE.

Under the Future Land Use Scenario, all risks for chemical and radiological exposures to future workers were within EPA's acceptable risk range for carcinogenic risks and below the acceptable Hazard Index of 1 for non-carcinogenic hazards. Exposure to groundwater as drinking water by hypothetical future residents living on site, near the Sewage Treatment Plant results in a Hazard Index greater than 1.0 (1.8 and 4.9 for an adult and young child, respectively). This is a highly unlikely condition, since residents in the area are already connected to the public water supply; manganese (not VOCs or radionuclides) in the unfiltered groundwater would contribute the majority of this potential health hazard. Radiological risks to the future on-site resident living at the sewage treatment plant using upper bound exposure estimates exceeded EPA's acceptable risk range, resulting primarily from external exposure associated with soils at the sewage treatment plant berms.

The Future Land Use scenario indicated that the non-carcinogenic health hazard and the carcinogenic risk from fish consumption would be above acceptable levels for a hypothetical on-site resident living at the Sewage Treatment Plant. This risk evaluation assumed that future fish consumption consisted only of fish caught on site. Note, however, that on-site sections of the river frequently dry up and prevent the river from supporting a population of sufficient size or number to sustain continued fishing pressure. The risk assessment also assumed that no remediation would occur and that the average PCB concentration in fish would be the same fifty years in the future as it was in on-site fish in 1998.

Ecological Risk Assessment

An Ecological Risk Assessment was performed to determine if any contaminants posed an unacceptable risk to ecological receptors. Ecological receptors include any plants and animals that could be exposed to contaminants now, or in the future.

The Process

A four-step process is used to assess site-related ecological risks for a maximum exposure scenario: *Problem Formulation* — a qualitative evaluation of contaminant release, migration and fate; identification of contaminants of concern, receptors, exposure pathways, and known ecological effects of the contaminants; and a selection of endpoints for further study. *Exposure Assessment* — a quantitative evaluation of contaminant release, migration and fate; characterization of exposure pathways and receptors; and measurement or estimation of exposure point concentrations. *Ecological Effects Assessment* — literature reviews, field studies and toxicity tests, linking contaminant concentrations to effects on ecological receptors. *Risk Characterization* — measurement or estimation of both current and future adverse effects.

Habitats of interest in Operable Unit V are the Peconic River headwaters, wetlands, pine-oak forests, and deciduous forests. The Peconic River and its drainage is considered a significant habitat, and portions of

it are designated as a Scenic River by the State of New York. Most of the focus of the Ecological Risk Assessment is on the ecosystem related to the on-site headwaters of the Peconic River.

Ecological Risks from sediment and surface water contaminants were examined through chemical and radiological analysis of water and sediment, benthic invertebrate toxicity tests, fish and invertebrate surveys, and fish bioaccumulation studies. Contaminants of concern found in the sediment included metals (particularly copper, mercury, and silver), PCBs, pesticides, and low levels of radionuclides.

Results

The assessment indicated that in the areas with the highest levels of copper, mercury and silver, the benthic invertebrate community is impacted; however, in general, the sediment contaminants are limited in their bioavailability. The areas of impact are located downstream of the STP in on-site depositional areas. The general lack of flow off site reduces the opportunity for significant transport of contaminants downstream of the site.

The fish tissue study also indicated that most of the contaminants found in the sediment were not bioaccumulating in fish tissue. However, three of the contaminants of concern [PCBs, DDD (a product of DDT degradation), and mercury] apparently bioaccumulated in the fish tissues relative to background concentrations.

Concentrations of radionuclides detected in surface water and sediment of the Peconic River were compared to benchmark values established for protection of aquatic life. All concentrations were many times lower than the benchmark values. This indicates that the radionuclides in the Peconic River do not pose a risk to aquatic life.

The food chain models determined that risks to the target species existed, particularly from mercury, PCBs, DDD and silver. Mercury, PCBs, and DDD, as measured in the tissue of on-site fish, pose the most risk to exclusively fish-eating species (for example, mink and belted kingfishers). The exposure of wildlife was modeled based on conservative assumptions, primarily consumption of only contaminated fish from on site. Fish-consuming wildlife feeding exclusively on contaminated fish could be exposed to concentrations of mercury, PCBs, or DDD greater than the No-Observable-Effect-Levels, though usually lower than the Lowest-Observable-Effect-Levels.

Risk to terrestrial wildlife was assessed through modeling exposure of wildlife to contaminated soils of the Sand Filter Beds and Berms. The opportunity for exposure is limited based on the habitat potential of the Sand Filter Beds, so this actually represents a hypothetical future scenario. The greatest potential risk was found to be due to mercury and silver, which could be translocated to plants from the soil, and accumulated in small mammals or invertebrates which could then be consumed by predators such as fox and hawk.

VII. Actions To Date

Several actions have been taken to date to address contamination at the Sewage Treatment Plant and in the Peconic River. These actions are listed in Table 2.

Administrative Record Locations

The Feasibility Study Report, Proposed Plan and all Administrative Record documents can be found at the following locations:

Longwood Public Library
800 Middle Country Road
Middle Island, NY 11953
Phone: (631) 924-6400
Contact: Reference Librarian

Mastics-Moriches-Shirley Community Library
301 William Floyd Parkway
Shirley, NY 11967
Phone: (631) 399-1511
Contact: Reference Librarian

Brookhaven National Lab
Research Library
Technical Information Division
Building 477A
Upton, NY 11973
(631) 282-3483
Contact: Reference Librarian

U.S. EPA — Region II
Administrative Records Room
290 Broadway
New York, NY 10001-1866
Phone: (212) 637-4296
Contact: Jennie Delcimento

Table 2.	Actions to Date in Operable Unit V
Imhoff Tank Removal Action	Sludge removed and shipped for disposal (1995). Tanks demolished (1997).
Sewage Treatment Plant Upgrade	Upgrade from primary to tertiary treatment completed (1998).
Satellite Disposal Area Remediation	Bromine trifluoride cylinders and wooden boxes of laboratory chemicals removed (1985).
Replacement and Capping of Formerly Leaking Sewer Lines	Replaced (1993).
Pollution Prevention/ Waste Minimization Program	Ongoing source reduction program.
Hookups to Public Water	Businesses and homes offered connection to public water (1997).

In a project completed in 1998, the sewage treatment plant was upgraded from primary to tertiary treatment. This upgrade further reduced contaminant concentrations discharged to the Peconic River.

The Imhoff Tanks sludge was found to contain elevated levels of metals and low levels of radioactivity. The Imhoff Tank sludge was removed from the tanks in September/October 1995. The sludge was dewatered using absorbent material, repackaged and disposed of off site. In 1997, the tanks were demolished, filled and capped. This was a final removal action, and no further action is required.

Remediation of the Satellite Disposal Area was carried out in 1985. At that time, bromine trifluoride cylinders and two boxes of laboratory chemicals were removed from the area. The soils and groundwater in the Satellite Disposal Area were thoroughly characterized during the Remedial Investigation and no contaminants were detected at levels requiring remediation. No further action is proposed for this area.

Many of the projects that are part of the Lab's Pollution Prevention/ Waste Minimization program specifically address sources of sanitary sewer contaminants. By implementing a source reduction program, contributions of contaminants to the BNL sanitary sewer and ultimately the Peconic River are being minimized.

DOE installed public water supply mains and has offered resident connections to mains for homes located in areas with the potential to be impacted by TCE concentrations greater than the drinking water standard of 5 ppb. DOE has also installed monitoring wells within the area potentially impacted by VOC contamination greater than 5 ppb and outpost wells at the perimeter of the hookup area. These wells will be monitored to confirm the improvement of drinking water quality within the hookup area and to provide assurance that areas beyond the hookup area do not receive groundwater above drinking water standards.

VIII. Basis for Cleanup

Based on the results of the Remedial Investigation, it was determined that contamination in sediments located in the depositional areas of the on-site Peconic River headwaters pose an ecological concern. The contaminants of concern are mercury, silver, copper, PCBs, DDD and radionuclides.

Remedial action objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards such as ***applicable or relevant and appropriate requirements (ARARs)*** and risk-based levels established in the risk assessment. Based on the evaluation of the nature and extent of contamination in soils, groundwater, surface water and sediment, and the assessment of chemical and radiological risks associated with exposure to contaminants of potential concern, the following remedial action objectives were developed:

- Prevent the exposure of aquatic communities to contaminants at concentrations that are deemed to be toxic to aquatic life.
- Prevent the bioaccumulation of contaminants to protect potential consumers.
- Protect the ecosystem of the Peconic River.
- Minimize exposure pathways and transport mechanisms for sediment to protect human health and the environment.

remedial action objectives - the requirements that must be met by any remedial alternative.

applicable or relevant and appropriate requirements (ARARs) - "applicable" requirements mean those standards, criteria, or limitations promulgated under federal or state law that are required specific to a substance, pollutant, contaminant, act, location, or other circumstance at a CERCLA site.
"Relevant and Appropriate" requirements mean those standards, requirements, or limitations that address problems or situations sufficiently similar to those encountered at the CERCLA site such that their use is well suited to that particular site.

A sediment toxicity study using site sediments was performed to develop toxicity-based cleanup goals for mercury, silver and copper (Table 3). PCBs, DDD and low-level radionuclides are largely co-located with the elevated metals, and will be cleaned up during remediation of the metals. The post-excavation sampling will confirm that cleanup goals have been met and that the total dose attributable to any residual radionuclides are below guidelines. Post-excavation sampling will also determine whether residual levels of PCBs and DDD are acceptable.

Soils in the sand filter beds and adjacent berms contain elevated levels of mercury, silver, chromium, lead and radionuclides. Elevated levels of mercury and cesium-137 will be excavated in a localized removal of contaminated soil.

Cleanup goals for the localized removal of soil in the sand filter beds and adjacent berms were chosen based on the EPA action level for the protection of groundwater for mercury (2 ***parts per million***). The cleanup goal for cesium-137 is 67 pCi/g, a value derived assuming an industrial land use scenario and consistent with cleanup values derived in another BNL Operable Unit (OU I). This cleanup goal requires institutional control of the area and five-year reviews.

parts per million (ppm) - a ratio of the mass of a contaminant to the total mass of the contaminant and medium (usually soil or water). For example, 1 ppm of mercury can mean 1 gram of mercury in 1 million grams of soil.

Low levels of volatile organic compounds (VOCs), primarily TCE, have been detected in groundwater both on and off site. To be sure that the health of the residents located downgradient of OU V is protected, homes and businesses in the OU V area were offered public water in 1997. Outpost monitoring wells have been placed along the predicted path of the contamination and additional groundwater monitoring data will be collected.

Table 3.	Cleanup Goals for Sediments*
Mercury	9.8 mg/kg
Silver	88.9 mg/kg
Copper	310 mg/kg

** The cleanup goals for these contaminants are based on a toxicity study using site sediments.*

IX. Summary of Remedial Alternatives

CERCLA requires that each site remedy be protective of human health and the environment, be cost effective, comply with other statutory laws, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. In addition, the statute includes a preference for use of treatment as a principal element for the reduction of toxicity, mobility or volume of the hazardous substances.

Peconic River Sediments

Five alternatives were proposed for cleanup of the Peconic River sediments, and retained for detailed analysis in the Feasibility Study report. These alternatives are briefly described below and then evaluated in the next section.

Alternative 1 — No Action: The no action alternative includes no remedial activities. In accordance with the National Contingency Plan, the No Action Alternative is required to be assessed for comparison to the other alternatives. Long-term monitoring of surface water and sediments would be conducted under this alternative to monitor the recurrence of contaminant deposition. Groundwater monitoring for VOCs and radionuclides would also be performed as part of this and all other alternatives.

Alternative 2 — Excavation/Drying Beds/Off-site Disposal: This alternative consists of the dewatering of segments of the stream followed by sediment excavation using conventional earthmoving equipment. The sediment that is removed is then placed in a drying bed, where free liquids are drained by gravity until the solids content of the sediment is sufficient for off-site disposal. The free liquids are then filtered and discharged to the Sewage Treatment Plant. The dewatered sediment is shipped off-site to a licensed waste disposal site.

Alternative 3 — Limited Excavation/Drying Beds/Sediment Dispersion Control/Off-site Disposal: This alternative is similar to Alternative 2 except that excavation will be limited to three of the five contaminated areas (A, D, and E) in order to minimize impacts to the central wetland area of higher ecological value (east of the firebreak). A silt curtain will be placed near the off-site boundary stream gauging station in Area D (see Figure 2) to enhance the properties of the lower depositional area (at North Street). The silt curtain, together with the lower depositional area, would function as a sediment trap for contaminated sediments that

Alternative 1
No Action:
- Contamination would be left in place
- Monitoring of surface water and sediment will continue for 5 years. Then, the need for monitoring will be reassessed.
- Groundwater will continue to be monitored. The need for continued monitoring will be reviewed every 5 years.
- Cost: $1,383,525

Alternative 2
Excavation/Drying Beds/ Off-site Disposal:
- Sections of stream would be dewatered and sediment excavated
- Drying beds would remove excess liquids from sediments
- Dewatered sediment would be disposed of off-site
- Monitoring of surface water and sediment will continue for 5 years. Then, the need for monitoring will be reassessed.
- Groundwater will continue to be monitored. The need for continued monitoring will be reviewed every 5 years.
- Cost: $5,947,926

Alternative 3
Limited Excavation/Drying Beds/Sediment Dispersion Control/Off-site Disposal:
- Sections of stream would be dewatered and sediment excavated
- Excavation would be limited to area A and area D to avoid impacting aquatic habitats in areas B and C
- Drying beds would remove excess liquids from sediments
- Dewatered sediment would be disposed of off-site
- A silt screen would be placed at the site boundary to help prevent future off-site migration of contaminants

(continued on next page)

may resuspend and migrate downstream from the unexcavated central wetland areas (B and C). Monitoring of the lower depositional zone will determine the need for future re-excavation in the area.

Alternative 4 — Excavation/Drying Beds/Beneficial Reuse: This alternative is similar to Alternative 2 except that instead of being shipped off site to a disposal facility, the dewatered sediment will be considered for potential beneficial reuse either on site or off site.

Alternative 5 — Excavation/Phytoremediation/Off-site Disposal: In this alternative plants will be used to absorb contaminants from the Peconic River sediment. The top six inches of surface sediment from the Peconic River known to contain contaminants at concentrations that exceed cleanup goals will be removed using the stream dewatering and conventional excavation techniques. The phytoremediation will be conducted by placing the excavated sediment in a large, shallow drying bed which must be constructed near the excavation. The material in the drying bed is conditioned through the addition of fertilizer, lime, and other soil amendments, as necessary. Once the soil conditions have been optimized, the bed is tilled and seeded followed by irrigation. The plants are harvested at intervals of 6 to 9 weeks. Crops will continue to be harvested until cleanup goals are met. After harvesting, the biomass containing the contaminants will be cut and transported to an off-site disposal facility. This is a new innovative technology, and crops that are capable of removing all the contaminants of concern to the cleanup goals have not been identified.

Sewage treatment plant (sand filter beds and berms)

A best management practice localized removal is proposed to remove high levels of mercury and cesium-137 in soils in the sand filter beds and adjacent berms. This removal of contamination will reduce the potential for leaching and subsequent migration to groundwater and the Peconic River and will further reduce risks associated with cesium-137 in soils. Soils from the sand filter beds and adjacent berms exceeding cleanup goals would be removed through excavation. Excavated portions of the sand beds would be replaced with sand or gravel, and excavated areas on the berms would be backfilled with clean fill, compacted and graded. Excavated materials will be disposed of in a licensed off-site disposal facility. Institutional control of the area will be maintained and five-year reviews will be conducted.

Groundwater

To be sure that the health of the residents located downgradient of OU V is protected, homes and businesses in the OU V area were offered public water in 1997. Investigations of soil and groundwater at the STP indicate that there are no continuing sources of VOC contamination, and VOC concentrations in groundwater are decreasing. Outpost monitoring wells have been placed along the predicted path of the groundwater and additional groundwater data will be collected. If future monitoring data suggest a need for a groundwater remedy, the OU V remedy will be modified.

X. Analysis and Comparison of Alternatives

DOE has identified its preferred remedy by evaluating all of the alternatives for the Peconic River Sediments against nine evaluation criteria

established by EPA. The comparison of alternatives, including advantages and disadvantages, is summarized in Table 4 and described below.

1. Overall Protection of Human Health and the Environment addresses whether an alternative provides adequate protection to human health and the environment, and describes how risks are eliminated, reduced, or controlled through treatment, engineering controls or institutional controls.

Alternative 1 requires no disruption of the wetlands, forested areas, or biota; however, the contaminants present will remain and continue to impact benthic communities in the areas of high concentrations.

Alternatives 2, 3, 4, and 5 are comparable in that they all remove contaminated sediments that are presently posing a risk to the aquatic community and wildlife that consumes fish. However, excavation of the sediment will result in the disturbance of the benthic community and the wetlands. Alternative 3 minimizes wetland disturbance because it does not excavate the wetlands of significant value in Areas B or C. These unexcavated sediments could continue to impact the benthic communities until natural deposition of clean sediments covers the contaminated sediment or contaminated sediments over a period of time.

Alternatives 2, 3, 4, and 5 all require construction activities to take place and will disrupt a mature and complex wetland ecosystem. Although remediation activities will include restoration of these wetlands, it will take a significant amount of time for the wetland ecosystem to rebuild itself to its former state.

The innovative status of phytoremediation (Alternative 5) creates challenges which have not yet been addressed and have the potential to create health and environmental problems. In some phytoremediation systems, chelating agents are applied to the soil to free bound contaminants from the soil and make them available to be accumulated by the plants. If chelating agents were to be applied, careful application would be necessary to avoid freeing contaminants into the water beyond the capacity of the plants to take them up, and distributing the dissolved contaminants back to the river.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) considers if a remedy meets all federal and state ARARs, including provisions for invoking a waiver.

Federal and State Regulations have not been promulgated for the cleanup of contaminated sediment, and so there are no chemical-specific ARARs for the evaluated alternatives. NYSDEC has developed screening levels for identifying potentially contaminated sediment, and these guidance values have been included as TBC (To Be Considered) requirements. Site-specific toxicity tests have identified contaminant concentrations at which effects on benthic invertebrates could be expected. Alternative 1 will not comply with these cleanup goals. Alternatives 2, 4, and 5 will comply with the cleanup levels, and Alternative 3 will eliminate some, but not all of the contaminated sediment above the cleanup levels.

Federal and State regulations require that impacts to wetlands be minimized unless no other viable option exists. Although Alternatives 2, 3, 4 and 5 involve the disturbance of wetland areas, they will comply with location-specific ARARs because the wetlands will be restored. These

Alternative 3
(continued from last page)
- Monitoring of surface water and sediment will continue for 5 years. Then, the need for monitoring will be reassessed.
- Groundwater will continue to be monitored. The need for continued monitoring will be reviewed every 5 years.
- Cost: $5,487,243

Alternative 4
Excavation/Drying Beds/ Beneficial Re-use
- Similar to Alternative 2, except that dewatered sediment would be considered for beneficial re-use on- or off-site.
- Cost: $5,109,184

Alternative 5
Excavation/Phytoremediation/Off-site Disposal:
- Sections of stream would be dewatered and top six inches of sediment excavated
- Plants would be used to remove contaminants from excavated sediment
- Harvested plants would be disposed of off-site at a permitted facility.
- Remaining sediments would be used for fill or to grade the stream
- Monitoring of surface water and sediment will continue for 5 years. Then, the need for monitoring will be reassessed.
- Groundwater will continue to be monitored. The need for continued monitoring will be reviewed every 5 years.
- Cost: $7,108,396

United States Department Of Energy

The **U.S. Department of Energy (DOE**) is one of the three agencies identified in the Interagency Agreement, which establishes the scope and schedule of remedial investigations at BNL. Correspondence with DOE staff concerning this project can be found in the Administrative Record under Operable Unit V.

For additional information concerning DOE's role in preparing this proposed plan, contact:

John Carter
DOE - Brookhaven Group
P.O. Box 5000
Upton, NY 11973-5000
(631) 344-5195

location-specific requirements include federal requirements outlined in 40 CFR 6.302 (a, b, g) (Protection of Wetlands, Floodplain Management, Area Affecting Stream or River), and 6 NYCRR 666 (National Wild, Scenic or Recreational Rivers) and a number of State requirements. Location-specific ARARs are listed in the OU V Feasibility Study.

There are also a number of action-specific requirements that must be complied with prior to implementation of these alternatives. These include requirements for Dredge and Fill Operations (33 CFR 320.2), the National Pollution Discharge Elimination System (40 CFR 122), Discharge of Storm Water Runoff (40 CFR 122.26), and others. Action-specific ARARs are listed in the OU V Feasibility Study.

3. Long-Term Effectiveness addresses the amount of remaining risk and the ability of an alternative to protect human health and the environment over time, once cleanup goals have been met.

Alternative 1 does not provide a permanent remedy. Under the No Action alternative, the contaminants will remain in place and rely on the occurrence of natural sedimentation to minimize the exposure of aquatic life to contaminated sediments.

Alternatives 2, 4, and 5 involve the complete removal of contaminated sediments that have been shown to pose a risk to the aquatic community. Therefore, they provide a permanent remedy for the existing contaminants of interest. Alternative 3 will leave some in-place contamination and restrict off-site migration, thereby eliminating any potential off-site risks. The potential for future deposition of contaminants will be reduced through the Sewage Treatment Plant upgrades and removal of laboratory sources.

4. Reduction of Toxicity, Mobility, or Volume addresses the anticipated performance of treatment that permanently and significantly reduces the toxicity, mobility, or volume of waste.

Alternative 1 will not reduce the volume or toxicity of the metals contained in the Peconic River sediments. The mobility and toxicity is anticipated to be reduced due to the occurrence of natural sedimentation.

Alternatives 2, 3, 4, and 5 will reduce the volume of contaminated material in the stream and limit the potential for exposure, though Alternative 3 provides less volume reduction than the other three. Once the sediment is excavated, Alternative 5 reduces the toxicity, mobility, and volume of contaminated material through phytoremediation. The other treatment alternatives are limited to dewatering and will not reduce the contaminant toxicity or mobility.

5. Short-Term Effectiveness and Environmental Impacts addresses the impact to the community and site workers during construction or implementation, and includes the time needed to finish work.

Alternative 1 involves no remedial actions that have the potential to impact worker health and safety or the surrounding community. Alternatives 2, 3, 4, and 5 pose minimal risk to workers during construction and remediation, but these can be minimized through standard health and safety practices.

6. Implementability addresses the technical and administrative feasibility of an alternative, including the availability of materials and services required for cleanup.

Alternative 1 takes the least effort to implement from a technical and administrative standpoint. Administratively, Alternatives 2, 3, 4, and 5 may be difficult to implement due to the extensive permitting requirements. Alternative 5 is anticipated to be the most difficult to implement from an effectiveness standpoint, because this is an innovative technology. Crops that will remove the contaminants of concern down to cleanup goals will have to be identified, and the length of time needed to meet cleanup goals is uncertain. Alternative 4 can only be implemented if a beneficial use for the sediments can be identified.

7. Cost compares the differences in cost, including capital, operation, and maintenance costs. Cost estimates are based on present worth costs. For estimated current costs of the sediment remedial alternatives, see Table 5.

Alternative 1 involves no remediation or disturbance of wetlands; therefore, this alternative is the lowest cost option. Long-term monitoring costs are the only costs involved as part of Alternative 1. Of the remaining alternatives, Alternatives 3 and 4 are the most cost effective option since they either involve beneficial reuse of the sediments instead of disposing of wastes, or less volumes to be disposed of. Alternative 5, phytoremediation, is the most expensive.

8. State Acceptance addresses whether the State agrees with, opposes, or has no comment on the preferred alternative. State acceptance is not formally evaluated until after the public comment period ends.

9. Community Acceptance addresses the issues and concerns the public may have regarding each of the alternatives. This criterion is not evaluated formally until comments on the Proposed Plan are reviewed.

Table 4.	Summary of			
Alternative				
	1. Protection of Human Health and the Environment	**2. Compliance with ARARs**	**3. Long-term Effectiveness**	
1. No Action	Contaminants would remain and continue to impact benthic communities. No disruption of wetlands or benthic community.	No chemical-specific ARARs, NYSDEC guidance values are TBC. Will not meet cleanup goals.	Contaminants will remain in place. No permanent remedy.	
2. Excavation/ Drying Beds/Off-site Disposal	**Remove contaminants that pose a risk. Protects on and off-site benthic communities. Disturbance of wetlands and benthic community.**	**No chemical-specific ARARs, NYSDEC guidance values are TBC.Will meet cleanup goals.Will comply with location-specific and action-specific requirements.**	**Permanent remedy. Contaminated sediments removed.**	
3.Limited Excavation/ Sediment Dispersion Control/Drying Beds/ Beneficial Reuse	Remove most contaminants that pose a risk.Protects off-site benthic communities but not all on-site communities.Disturbance of wetlands and benthic community.	No chemical-specific ARARs, NYSDEC guidance values are TBC.Will meet cleanup goals.Will comply with location-specific and action-specific requirements.	Not all contaminated sediment removed. Protects off-site communities.	
4. Excavation/ Drying Beds/ Beneficial Reuse	Remove contaminants that pose a risk. Protects on and off-site benthic communities. Disturbance of wetlands and benthic community.	No chemical-specific ARARs, NYSDEC guidance values are TBC.Will meet cleanup goals.Will comply with location-specific and action-specific requirements.	Permanent remedy. Contaminated sediments removed.	
5.Excavation/ Phytoremediation/ Off-site Disposal	Remove contaminants that pose a risk. Protects on and off-site benthic communities. Disturbance of wetlands and benthic community.	No chemical-specific ARARs, NYSDEC guidance values are TBC.Will meet cleanup goals.Will comply with location-specific and action-specific requirements.	Permanent remedy. Contaminated sediments removed.	

Comparative Analysis of Sediment Alternatives

Evaluation Criteria

4. Reduction of Toxicity, Mobility or Volume	5. Short-term Effectiveness	6. Implementability	7. Cost
Will not reduce toxicity or volume. Mobility will be reduced due to naturally occurring processes.	No actions that may impact workers or the surrounding community.	Easiest to implement. No action required.	$1,383,525
Will reduce volume and potential for exposure. Will not reduce toxicity. Will not reduce mobility.	**Minimal risks to workers during construction and remediation.**	**May be difficult to implement due to extensive permitting requirements.**	**$5,947,926**
Will reduce volume and potential for exposure. Will not reduce toxicity. Will not reduce mobility.	Minimal risks to workers during construction and remediation.	May be difficult to implement due to extensive permitting requirements.	$5,487,243
Will reduce volume and potential for exposure. Will not reduce toxicity. Will not reduce mobility.	Minimal risks to workers during construction and remediation.	May be difficult to implement due to extensive permitting requirements.	$5,109,184
Will reduce volume and potential for exposure. Will not reduce toxicity. Will reduce mobility.	Minimal risks to workers during construction and remediation.	May be difficult to implement due to extensive permitting requirements. Most difficult to implement, new technology. Need to identify appropriate crops. Length of time to meet cleanup goals is uncertain. Construction of large drying beds will require additional permitting.	$7,108,396

Table 5.	Summary of Estimated Costs for Sediment Remedial Alternatives	
Alternative	**Description**	**Present Worth ($M)**
1	No Action	1.38
2	Excavation/Drying Beds/Off-site Disposal	5.95
3	Limited Excavation/Drying Beds/Sediment Dispersion Control/Off-site Disposal	5.49
4	Excavation/Drying Beds/Beneficial Reuse	5.11
5	Excavation/ Phytoremediation/Off-site Disposal	7.11

XI. Administrative Record Repository Locations

The Feasibility Study Report, Proposed Plan, and all Administrative Record documents can be found at the following locations:

Longwood Public Library
800 Middle Country Road
Middle Island, NY 11953
Phone: (631) 924-6400
Contact: Reference Librarian

Mastics-Moriches-Shirley Community Library
301 William Floyd Parkway
Shirley, NY 11967
Phone: (631) 399-1511
Contact: Reference Librarian

Brookhaven National Laboratory Research Library
Technical Information Division
Building 477A
Upton, NY 11973
Phone: (631) 282-3483
Contact: Reference Librarian

U.S. EPA — Region II Administrative Records Room
290 Broadway
New York, NY 10001-1866
Phone: (212) 637-4296
Contact: Jennie Delcimento

XII. Appendix A

Table A-1.	Description of Operable Units at Brookhaven National Laboratory
Operable Unit	**Description**
I	Operable Unit I is a relatively undeveloped 950-acre area in the southeastern part of the BNL site. It includes historical waste handling areas such as the Former and Current Landfills (AOCs 2 and 3), and the Former Hazardous Waste Management Facility (AOC 1). It also includes the Ash Pit (AOC 2F) and two recharge basins. Operable Unit I contains six areas covered by accelerated removal actions: the Current and Former Landfills, Chemical/Animal Pits and Glass Holes, the Interim Landfill, the Slit Trench and Groundwater.
II/VII	Operable Unit II/VII consists of several AOCs located in the developed central portion of the site. It includes contaminated soils and out-of-service underground storage tanks and pipelines proposed for removal at the Waste Concentration Facility (AOC 10), along with various isolated areas of contaminated surface soils (AOC 16, 17, 18). It also includes the BLIP facility (AOC 16K).
III	Operable Unit III contains the south central and developed portions of the site. This Operable Unit contains most of the site's contaminated groundwater.
IV	Operable Unit IV is located on the east-central edge of the developed portion of the site. It includes the 1977 Oil/Solvent Spill as well as the Reclamation Facility Building 650 and Sump Outfall Area (AOC 6), where radiologically contaminated soils have been found.
V	Operable Unit V is located in the northeast portion of the site and includes the Sewage Treatment Plant (AOC 4) and releases to the Peconic River.
VI	Operable Unit VI is located on the southeastern edge of the site. It is a largely wooded area which contains various agricultural research fields and manmade experimental basins known as the Upland Recharge/Meadow Marsh Areas (AOC 8). No contaminated soils of concern have been found in this Operable Unit, however contaminated sediments in two of the manmade basins pose an ecological risk to the Tiger Salamander. Ethylene dibromide, a pesticide, has been found in groundwater south of BNL's southern boundary, and is addressed in a separate Record of Decision.

Table A-2.	Description of Areas of Concern in Operable Unit V
Area of Concern	**Description**
AOC 4 Sewage Treatment Plant	The Sewage Treatment Plant (STP) processes sanitary sewage for BNL facilities and operates under a permit from New York State, which sets discharge limits for chemicals. The STP is a tertiary treatment plant consisting of a clarifier, aerobic treatment, denitrification, and ultraviolet disinfection and a sand filtration system for final polishing. The STP was built in stages from 1940 through 1944, and was upgraded in 1967 and 1997. Approximately 800,000 gallons of treated effluent are discharged each day into the headwaters of the Peconic River. The Peconic River AOC includes: the Imhoff Tank, Sand Filter Beds, Hold-up Ponds, Satellite Disposal Area and Peconic River sediments and surface water.
Peconic River sediments and surface water	Peconic River sediments and surface water have been included as part of Operable Unit V. The Peconic River headwaters begin west of the Sewage Treatment Plant and proceed to the east, off the BNL site, where it eventually joins with other headwater streams and becomes the Peconic River.
Sludge Drying Beds (Sub-AOC 4A)	Eight lined Sludge Drying Beds were used for periodic passive dewatering of sludge from the clarifier. The sludge beds have not been used since 1990.
Sand Filter Beds (Sub-AOC 4B)	The Sand Filter Beds receive treated water released from the aeration basin. It is estimated that 10 to 20 percent of the water may be lost to groundwater recharge through the filter beds.
Imhoff Tank (Sub-AOC 4C)	An Imhoff Tank was employed for the separation of solids from 1947 to 1967. The Imhoff Tank contents were removed and disposed of off-site during 1995 and 1996 and the tank was demolished in 1997. The separation of solids now takes place in the clarifier.
Hold-up Ponds (Sub-AOC 4D)	Two Hold-up Ponds are used for emergency hold-up and overflow storage. The ponds are lined with a plastic sheet, which is reinforced with fabric to ensure its integrity. A groundwater monitoring network will be placed in the area of the hold-up ponds as part of the Lab's Groundwater Improvement Program (Phase II) to assure the continued effectiveness of the hold-up ponds.
Satellite Disposal Area (Sub-AOC 4E)	The Satellite Disposal Area is located several hundred feet south of the hold-up ponds, but is not associated with the operation of the Sewage Treatment Plant. The area was used during the early 1960s for disposal of unknown chemicals and leaking bromine trifluoride cylinders and has not been used since. In 1985, the cylinders and two wooden ammunition boxes of laboratory chemicals were removed from the area.

Table A-2, cont.	Description of Areas of Concern in Operable Unit V
Area of Concern	**Description**
AOC 21 Retired and Capped, Formerly Leaking Sewer Pipes	BNL's first sanitary sewer lines were installed as early as 1917. These were repaired and upgraded in the 1940s. These sewer lines carried various laboratory and sanitary wastes from research and support facilities to the STP. Approximately 3,400 feet of underground lines are contained within Operable Unit V. A study was conducted of the sewer line integrity between the various BNL facilities and the STP. This study indicated that there was about a 13 to 15 percent line loss between major facilities and the STP; most of this line loss occurred in the 30-inch vitreous clay pipes used between the merger of all the sewer lines and the STP. The Leaking Sewer Pipes in Operable Unit V were replaced in January 1993, and all wastewater flow has been diverted to the newly installed sewer lines.
AOC 23 Eastern Tritium Plume	Groundwater investigations were conducted in 1984 and 1985 in response to elevated levels of tritium in the STP effluent in 1984, revealed the existence of a groundwater contaminant plume at the eastern border of the BNL site. This is known as the Eastern Tritium Plume. Effluent from the Sewage Treatment Plant can reach groundwater from either losses from the Sand Filter Beds or by recharging along the Peconic River. The source of the tritium was distillate from the evaporation process at the Waste Concentration Facility that was discharged to the STP. At the most impacted off-site monitoring well, the tritium concentration had reached 25,000 picocuries per liter (pCi/l); the drinking water standard is 20,000 pCi/l. In response to the event described above, the Suffolk County Department of Health Services (SCDHS) began sampling private supply wells in an area downgradient of the contamination released from the STP and east and southeast of BNL in order to determine if the contamination had reached private supply. Tritium was detected in some of the samples, but none of the concentrations in the wells approached the drinking water standard. The highest level found off Laboratory property in 1999 is 822 picocuries per liter, four percent of the drinking water standard. The most recent maximum detection for Operable Unit V groundwater on site is 2,057 picocuries per liter.

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What's Your Opinion?

The DOE, EPA and DEC want and need to hear from you to effectively decide what actions to take at Brookhaven National Laboratory.

Comments: